CLAIMS

1. Process for analyzing an object (2), particularly a radioactive waste package, that might contain a fissile material or a fertile material or both, the fissile material comprising M fissile isotopes and the fertile material comprising N fertile isotopes, where M and N are integer numbers equal to at least 1, this process being characterized in that: species

- the object is irradiated by a neutron flux formed of thermal, epithermal and fast neutrons and resulting from a sequence of initial pulses of fast neutrons, the thermal neutrons causing fission in the fissile material and the epithermal and fast neutrons causing fission in the fissile material and in the fertile material,
- the prompt and delayed neutronic signals emitted by the object after each pulse are measured, and these signals are accumulated to obtain the sum of all signals after the last pulse,
- this sum is used to determine the contribution Sp of prompt neutrons produced by thermal fission and the contribution Sr of delayed neutrons produced by thermal, epithermal and fast fission reactions,
- Sp and Sr are expressed as linear combinations of the quantities of M+N isotopes, the

coefficients of these linear combinations being previously determined by calibration, and

- the quantity of each of the M+N isotopes is determined from Sp and Sr thus expressed and at least M+N-2 additional items of information about quantities of M+N isotopes.

2. Process according to claim 1, in which this additional information may consist of correlations between the quantities of M+N isotopes.

improper dependency

3. Process according to either claim 1 or 2, in which the fissile and fertile materials contain uranium 235, uranium 238, plutonium 239 and plutonium 241.

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4. Device for analyzing an object (2), particularly a radioactive waste package, that may contain fissile material or fertile material or both, the fissile material containing M fissile isotopes and the fertile material containing N fertile isotopes, where M and N are integer numbers equal to at least 1, this device being characterized in that it comprises:

- means (8, 10) of irradiating the object by a neutron flux consisting of thermal, epithermal and fast neutrons and resulting from a sequence of initial fast neutron pulses, the thermal neutrons causing fission in the fissile material and the epithermal and fast neutrons causing fission in the fissile material and in the fertile material,

- means (4, 52) of counting neutrons, designed to measure prompt and delayed neutronic signals emitted by the object after each pulse, and
- means (6) of processing the signals thus measured, designed to accumulate these signals and, after the last pulse, to obtain the sum of all signals, to use this sum to determine the contribution Sp of prompt neutrons produced by thermal fission and the contribution Sr of delayed neutrons produced by thermal, epithermal and fast fission reactions, and to use Sp and Sr to determine the quantity of each of the M+N isotopes and at least M+N-2 additional items of information related to the quantities of M+N isotopes, expressing Sp and Sr as linear combinations of these quantities, the coefficients of these linear combinations being determined beforehand by calibration.

5. Device according to claim 4, in which the irradiation means comprise:
- at least one source (8) of fast neutrons operating in pulsed mode and,
- means (10) of thermalizing these fast neutrons.

6. Device according to claim 5, in which the thermalization means comprises a containment (10) that includes a central area (12) in which the object (2) will be placed and in which at least three sides are delimited by a thickness (14, 60) of moderator

material, the neutron source (8) being placed on a fourth side of this containment and the neutron counting means (4, 52) being placed on the three sides between the central area and the thickness of moderator material, a thickness of the multiplier material (22, 24, 50) being provided between the central area and the neutron source and between the central area and neutron counting means.

7. Device according to claim 6, in which each neutron counting means may also be surrounded by a thickness (26) of neutron poison material.

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8. Device according to either of claims 6 and 7, in which each neutron counting means may also be surrounded by a moderator material (28).

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9. Device according to any one of claims 6 to 8, also comprising a wall (36) made of neutron poison and moderator materials that delimits the fourth side of the containment, the thickness (22) corresponding to the multiplier material being between this wall (36) and the central area (12).

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10. Device according to any one of claims 6 to 9, also comprising means (46, 48; 68, 70, 72) of rotating the object (2) within the central area of the containment.